



## Functional Biomechanics & Applied Kinesiology

Included in this home study is:

- The written course material
- A 30 question test
- An answer sheet
- An evaluation form

To complete this home study:

- Read and study the course materials.
- Answer the 30 questions on pages 34-38 using the enclosed answer sheet.
- Complete the home study evaluation form on page 39.

**To receive 6 continuing education credits:**

**Return answer sheet by:**

**Mail:** NETA  
Attention: Home Study Coordinator  
5955 Golden Valley Road, Suite 240  
Minneapolis, MN 55422

– OR –

**Fax:** 763-545-2524

– OR –

**Complete online:** [www.netafit.org](http://www.netafit.org). Select "Home Study", click on "Home Study Exam", select course title from the "Choose Test" drop down menu, enter item number and exam code listed below.

<b>Item #:</b> 9193	<b>Serial #:</b> <i>(Leave serial number blank when taking exam online.)</i>
<b>Exam Code #:</b> 919391	

- A minimum score of 70% is required to receive the CEC's for this home study course.
- Your Certificate of Completion will be mailed to you. Please allow 2-4 weeks for processing.

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## Course Overview

Biomechanics is an extensive area of human movement science which requires a working knowledge of anatomy, physiology, and kinesiology. As a fitness professional, it is important to understand the principles of functional biomechanics and applied kinesiology in order to safely and effectively implement appropriate exercises for your clients. This home study course is intended for fitness professionals who have an educational background in an exercise science-related discipline or an accredited certification in the fitness industry. *Functional Biomechanics & Applied Kinesiology* is an introductory-level course with an emphasis on movements observed during exercise and the corresponding joint actions, muscles, and safety considerations.

The goal of this home study course is to provide fitness professionals with transferrable information to improve their current understanding of exercise technique, muscle function during specific movements, and safe exercise selection and decision-making during the implementation of fitness activities.

*Functional Biomechanics & Applied Kinesiology* is not an all-inclusive course. The content is primarily focused on the understanding of basic principles of biomechanics and kinesiology as well as the evaluation and interpretation of common postural deviations. Please keep in mind, the diagnosis and rehabilitation of musculoskeletal issues are beyond the scope of practice of the fitness professional. Clients should be referred to a physician when an orthopedic injury is suspected. Appropriate medical clearance should be obtained for those with pre-existing orthopedic considerations. It is necessary for fitness professionals to have a fundamental understanding of common exercise-related injuries so that appropriate exercise selection, instruction, and modification may be provided when working with clients who have, or are at risk for, orthopedic limitations.

### Course Objectives:

The objectives of the *Functional Biomechanics & Applied Kinesiology* home study course include:

- understand the basic principles of functional biomechanics as related to exercise;
- review the fundamental terminology related to kinesiology;
- understand static and dynamic postural analysis, common postural deviations, and implications related to efficiency of movement; and
- learn appropriate exercise selection and execution for those who exhibit postural misalignments.

## Section One: Introduction to Biomechanics

### What is Biomechanics?

**Biomechanics** is the study and application of the principles of mechanics, motion, and movement related to the biological systems of the human body. This field of study addresses the external forces applied to the body as well as the internal forces and resulting movement created by the musculoskeletal system. **Kinesiology** is derived from two Greek verbs which are translated to mean, “the study of movement” (Knudson, 2007). To ensure safe and effective selection of exercises, application of force, and movement of the body, fitness professionals must have a thorough understanding of anatomy, kinesiology, and biomechanics.

### Newton’s Laws of Motion

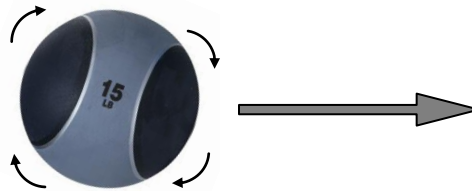
There are several natural laws that govern the external forces applied to the body and the corresponding movements that are generated by the musculoskeletal system. The most important laws as related to the study of biomechanics originate from the discoveries of a 17<sup>th</sup> century scientist named Sir Isaac Newton (1642-1727). Newton’s first law, **The Law of Inertia**, states that an object at rest will stay at rest and an object in motion will stay in motion (in the same direction and velocity) unless an external force acts upon the object.



Sir Isaac Newton  
(1642-1727)



With no outside forces acting against it, this kettlebell will never move.



With no outside forces acting against it, this medicine ball will never stop moving.

Since many of the synovial joints (e.g., shoulder, hip, knee, elbow) within the body rotate around an axis, the law of inertia can be applied to a concept known as **rotational inertia (RI)**. This refers to the reluctance of a body segment or object to rotate around an axis (joint). Rotational inertia is proportional to the mass of the body segment and/or object and the distribution or distance of that mass away from the axis of rotation. In other words, a heavier object will possess more ‘reluctance to rotate’ (i.e., inertia). Likewise, an object located farther from the axis of rotation (joint) will also possess more rotational inertia. For example, a baseball bat has more rotational inertia when held by the barrel (thick end) of the bat as opposed to the handle. Although the mass of the bat is unchanged, the center of this mass is moved closer to the axis, thus